U.S. Department of Transportation
Federal Aviation Administration

Advisory Circular

/INCLUDES CHANGE 1/

Subject: STANDARDIZED METHOD OF REPORTING AIRPORT PAVEMENT STRENGTH - PCN

Date: 6/15/83
Initiated by: AAS-200

AC No: 150/5335-5
Change:

1. PURPOSE. This advisory circular (AC) provides guidance for using the standardized International Civil Aviation Organization (ICAO) method to report airport pavement strength. The standardized method is known as the ACN/PCN method.

2. FOCUS. Member countries of ICAO are required to report pavement strength information for a variety of purposes. A new method has been developed which will be used as an international standard and will greatly facilitate the exchange of information. This AC provides specific guidance on how to report airport pavement strength using the standardized method.

3. RELATED READING MATERIAL. The publications listed in appendix 1 provide further information on the development and use of the ACN/PCN method.

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CHAPTER 1. INTRODUCTION

1. BACKGROUND. Through treaty agreements, the United States is a member of the International Civil Aviation Organization (ICAO) and is bound to comply with the requirements of ICAO to the maximum extent practical (see FAA Order 2100.13, FAA Rulemaking Policies, Chapter 11). Annex 14 - Aerodromes to the Convention of International Civil Aviation requires that each member country publish information on the strengths of all public airport pavements in its own Aeronautical Information Publication (AIP). In the past, the Annex recognized four methods of reporting airport pavement strength. Any one of the four methods was considered equal and acceptable, but mixed use made transfer of information between different methods difficult at best. As a result, the reporting of pavement strength information was inadequate.

2. APPLICATION. The use of the standardized method of reporting pavement strength applies only to pavements with bearing strengths of 12,500 pounds (5 700 kg) or greater. The method of reporting pavement strength for pavements of less than 12,500 pounds (5 700 kg) bearing strength remains unchanged.

3. DEVELOPMENT OF A STANDARDIZED METHOD. In 1977 the ICAO established a Study Group to develop a single international method of reporting pavement strengths. The study group was composed of experts nominated by six countries and three international organizations: Australia, Canada, France, Netherlands, United Kingdom, and United States; Airport Associations Coordinating Council, International Air Transport Association, and International Coordinating Council of Aircraft Industries Association. The study group developed the Aircraft Classification Number - Pavement Classification Number (ACN-PCN) method. Using this method, it is possible to express the effect of individual aircraft on different pavements by a single unique number which varies according to pavement type and subgrade strength, without specifying a particular pavement thickness. This number is the Aircraft Classification Number (ACN). Conversely, the load carrying capacity of a pavement can be expressed by a single unique number, without specifying a particular aircraft. This number is the Pavement Classification Number (PCN). The ACN and PCN values are defined thusly:

ACN - A number which expresses the relative structural effect of an aircraft on different pavement types for specified standard subgrade strengths in terms of a standard single wheel load.

PCN - A number which expresses the relative load carrying capacity of a pavement in terms of a standard single wheel load.

The system is structured so that a pavement with a particular PCN value can support, without weight restrictions, an aircraft which has an ACN value equal to or less than the pavement's PCN value. This is possible because ACN and PCN values are computed using the same technical basis.

4. DETERMINATION OF THE ACN. The computation of ACN values will rarely, if ever, be required by anyone other than aircraft manufacturers. The description of the ACN is presented here mainly for informational purposes. The ACN has been developed for two types of pavement--rigid or flexible--and for four levels of subgrade strengths.

a. For rigid pavements, the aircraft landing gear flotation requirements are determined by the Westergaard solution for a loaded elastic plate on a Winkler foundation (interior load case), assuming a concrete working stress of 399 psi (2.75 MPa). Four different subgrade strengths are considered: high--554 pci (150 MN/m^3), medium--296 pci (80 MN/m^3), low--148 pci (40 MN/m^3), and ultra low--74 pci (20 MN/m^3). Using these parameters, a standard single wheel load at a tire pressure of 181 psi (1.25 MPa) is computed for each subgrade strength. The standard single wheel load is expressed in kilograms and divided by 500 to obtain the ACN. Division by 500 is a rounding off process to make the numbers smaller and more manageable. (See ICAO Bulletin, Vol. 35, No. 1, 1980.)

b. For flexible pavements, aircraft landing gear flotation requirements are determined by the California Bearing Ratio (CBR) method. As with the rigid pavement, four different subgrade strengths are considered: high (CBR=15), medium (CBR=10), low (CBR=6) and ultra low (CBR=3). A standard single wheel load at a tire pressure of 181 psi (1.25 MPa) is computed for each of these subgrade strengths. The standard single wheel load is expressed in kilograms and divided by 500 to obtain the ACN. (See ICAO Bulletin, Vol. 35, No. 1, 1980.)

5. DETERMINATION OF THE PCN VALUE. The PCN numerical value for a particular pavement is determined from the allowable load rating, i.e., bearing strength, of the pavement. The allowable load rating can be determined by applying the principles contained in AC 150/5320-6, Airport Pavement Design and Evaluation. In determining the allowable load rating, such factors as frequency of operations and permissible stress levels should be taken into account. Once the allowable load rating is established, the determination of the PCN value is a process of converting that rating to a standard relative value. Curves for converting allowable load ratings to PCN values are presented in the following chapters.

6. LIMITATIONS. The PCN value is for reporting pavement strength only. The PCN value expresses the results of pavement evaluation in relative terms and cannot be used for pavement design or as a substitute for evaluation. Pavement design and evaluation are complex engineering problems which require detailed analyses. They cannot be reduced to a single number.

7. REPORTING THE PCN. The PCN system uses a coded format to maximize the amount of information contained in a minimum number of characters and to facilitate computerization. In addition to the previously discussed PCN numerical value, the PCN code includes: pavement type, subgrade category, allowable tire pressure, and method used to determine the PCN. Therefore, an example of a PCN code is 80/R/B/W/T--with 80 expressing the PCN numerical value, R is for rigid pavement, B for medium strength subgrade, W for high allowable tire pressure, and the T indicates the PCN value was obtained by a technical evaluation. All of the various coded entries are fully explained in chapter 2. Once a PCN value and the coded

entries are determined, the PCN code should be reported to the regional Federal Aviation Administration (FAA) Airports Division, either by writing the FAA or as part of the annual FAA updating of the Airport Master Record, FAA Form 5010-1. The PCN code is then forwarded to FAA headquarters and disseminated by the National Flight Data Center through aeronautical publications such as the Airport/Facility Directory and the Aeronautical Information Publication. The published PCN can then be compared with an aircraft's ACN to determine if the aircraft can operate on an airport's runways without weight restriction.

CHAPTER 2. PCN DETERMINATION

8. FORMAT. The PCN for any pavement is reported by a code consisting of five elements: PCN Numerical Value, Pavement Type, Subgrade Strength, Tire Pressure, and Evaluation Method. Each element of the code is explained in the following paragraphs.

9. PCN NUMERICAL VALUE. The PCN Numerical Value is a relative indication of the load carrying capacity of a pavement in terms of a standard single wheel load at a tire pressure of 181 psi (1.25 MPa). The PCN Numerical Value should be reported in whole numbers, rounding off any fractional parts to the nearest whole number. For pavements of variable strength, the controlling PCN Numerical Value for the weakest segment of the pavement should be reported as the strength of the pavement. Since the PCN Numerical Value is dependent on other elements in the code, the explanation of its computation comes in paragraph 14 of this chapter.

10. PAVEMENT TYPE. Two pavement types are recognized in the PCN method--rigid (R) or flexible (F). Composite or unconventional pavement should be coded as either Code R or Code F depending on the method used in computing the PCN. For example, if a runway is composed of rigid pavement with a bituminous overlay, the usual manner of determining the load carrying capacity is to convert the pavement to an equivalent thickness of rigid pavement; this is done even though the runway surface composition is asphalt. Hence in this instance, the pavement type should be reported as R in the PCN code.

11. SUBGRADE STRENGTH. Four subgrade strength categories are used to report subgrade strength for each pavement type. They are defined and coded in tables 2-1 and 2-2.

Table 2-1. SUBGRADE STRENGTH CATEGORIES

Category	Rigid Pavement k value Strength Range		Flexible Pavement CBR Strength Range	Code Designation
	lbs/in^3	MN/m^3		
High	greater than 400	greater than 120	greater than 13	A
Medium	201-400	61-120	8 - 13	B
Low	100-200	25-60	4 - 8	C
Ultra low	less than 100	less than 25	less than 4	D

Note: Guidance on the assignment of k valves and CBR values can be found in AC 150/5320-6.

For convenience, the subgrade strength categories have been related to soils classification. While it is important to have complete and accurate soils strength information, approximations based on soils classification may be used for the purposes of reporting PCN. Both the Unified and FAA soils classifications are shown in table 2-2. Although the FAA method has been phased out, it is shown here so that old records may be used and new soils tests will not have to be conducted merely for PCN purposes.

TABLE 2-2. SUBGRADE STRENGTH CATEGORIES BASED ON SOIL CLASSIFICATION

Category	Code	Soil Classification	
		Unified	FAA
High	A	GW, GP, GM,	Fa, F1, F2
Medium	B	GC, SW, SM, SP	F3, F4, F5
Low	C	SC, ML, CL, OL	F6, F7, F8, F9
Ultra-low	D	OM, CH, MH	F10

Note: See AC 150/5320-6 for further details on soil classification.

12. TIRE PRESSURE. Four different categories are used to report allowable tire pressure in the PCN code. They are defined and coded in table 2-3.

TABLE 2-3. ALLOWABLE TIRE PRESSURE CATEGORIES

Category	Range		Code Designation
	psi	MPa	
High	No limit	No limit	W
Medium	146-217	1.01-1.50	X
Low	74-145	0.51-1.0	Y
Very Low	0-73	0-0.5	Z

Tire pressure will have little effect on pavements with portland cement concrete surfaces. Portland cement concrete surfaces can usually accommodate high tire pressures. Tire pressures may be restricted on asphaltic concrete depending on the quality of the asphalt mix and climatic conditions. For pavements where tire pressure is restricted, the allowable tire pressure should be reported in accordance with table 2-3.

13. EVALUATION METHODS. Two pavement evaluation methods are recognized in the PCN system. If the evaluation represents the results of a technical study, the evaluation method should be coded T. If the evaluation is based on using aircraft experience, the evaluation method should be coded U. Technical evaluation (T) implies that some form of technical study and computation were involved in the

determination of the PCN. Using aircraft evaluation (U) means the PCN was determined by selecting the highest ACN among the aircraft currently using the facility and not causing pavement distress. No technical input is required for the using aircraft evaluation method. PCN values computed from allowable loads shown on FAA Form 5010-1, Airport Master Record, should be considered technical evaluations. Publication of a using aircraft evaluation on the FAA Form 5010-1 is permitted only by mutual agreement between the airport owner and the FAA.

14. COMPUTATION OF PCN NUMERICAL VALUES. Procedures for the computation of PCN numerical values are presented in two different categories--heavy load pavements, intended to support aircraft weighing 30,000 pounds (13 000 kg) or more, and light load pavements, intended to support aircraft weighing between 29,999 pounds (13 000 kg) and 12,500 pounds (5 700 kg). These categories were chosen to be consistent with FAA pavement design and evaluation standards.

a. Heavy Load Pavements. The computation of PCN numerical values is designed to require a minimum number of inputs. Charts have been developed which require input for subgrade strength category and allowable gross weight. With these two parameters, a PCN numerical value can be obtained. Charts to compute PCN values for single, dual, and dual-tandem landing gear are shown in figures 2-1 through 2-6. The single, dual, and dual-tandem ratings are for generalized landing gear configurations and do not represent specific aircraft. A conversion for double-dual-tandem landing gear was not prepared because this rating refers to a specific aircraft, the Boeing 747. In the generalized landing gear configurations, certain assumptions are made, i.e., all aircraft are assumed to have 95 percent of the gross weight carried by the main gear assembly and the nose gear assembly is assumed to carry 5 percent of the gross weight of the aircraft. Other assumed characteristics are discussed in the following subparagraphs.

(1) Single Wheel. Table 2-4 shows the characteristics which are assumed for the main landing gear assembly.

TABLE 2-4. SINGLE WHEEL ASSEMBLY

Gross Weight		Tire Pressure	
lbs.	kg	psi	MPa
30,000	13 600	75	0.52
45,000	20 400	90	0.62
60,000	27 200	105	0.73
75,000	34 000	120	0.83

Using the above assumptions, charts that convert single-wheel allowable gross weight to PCN numerical values, for both flexible and rigid pavements, are shown in figures 2-1 and 2-2.

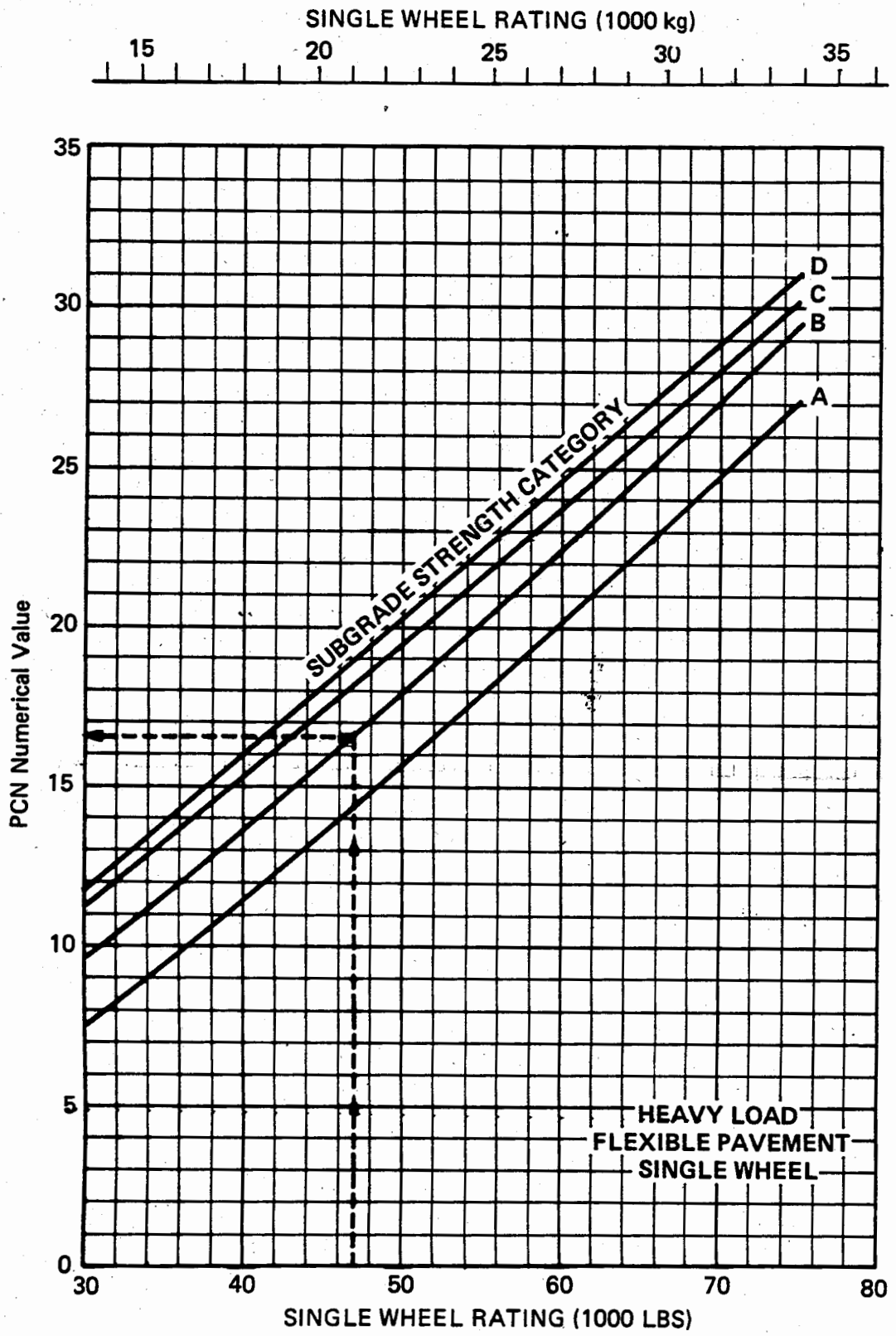

Figure 2-1. PCN Numerical Values for Single-Wheel Load Rating--Heavy Load Flexible Pavement

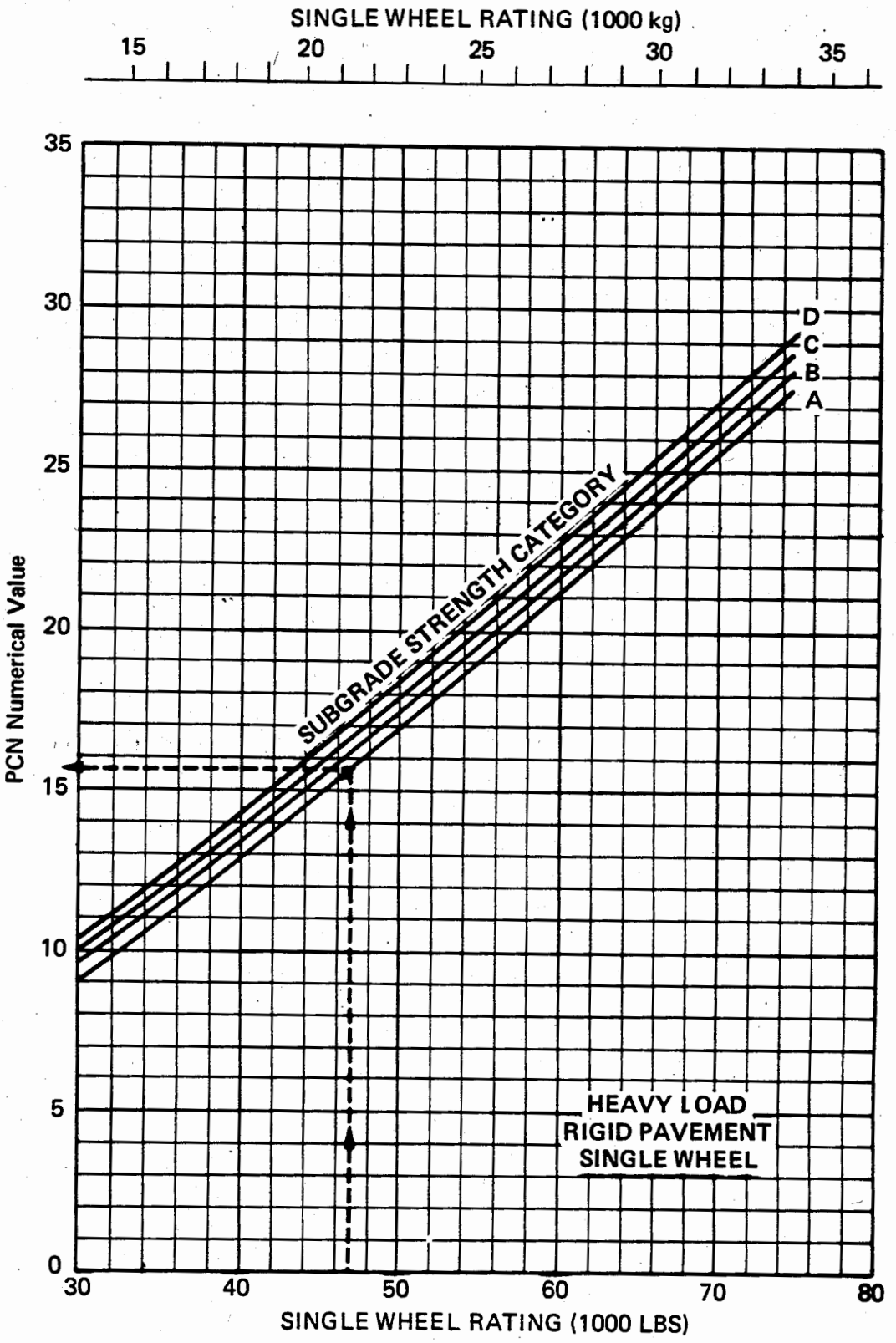

Figure 2-2. PCN Numerical Values for Single-Wheel ~~Load~~ Rating--Heavy Load Rigid Pavement

(2) Dual Wheel. Charts that convert aircraft gross weight to PCN numerical values for aircraft with dual-wheel landing gear were developed using the following characteristics.

TABLE 2-5. DUAL WHEEL ASSEMBLY

Gross Weight		Tire Pressure		Dual Spacing	
lbs.	kg	psi	MPa	in	cm
50,000	22 700	80	0.55	20	51
75,000	34 000	110	0.76	21	53
100,000	45 400	140	0.97	23	58
150,000	68 000	160	1.10	30	76
200,000	90 700	200	1.38	34	86

The charts that convert dual-wheel allowable gross weight to PCN values, for both flexible and rigid pavements, are shown in figures 2-3 and 2-4.

(3) Dual Tandem. Conversion charts to determine PCN numerical values from allowable dual-tandem loadings were developed assuming the following characteristics.

TABLE 2-6. DUAL TANDEM ASSEMBLY

Gross Weight		Tire Pressure		Dual Spacing		Tandem Spacing	
lbs	kg	psi	MPa	in	cm	in.	cm
100,000	45 400	120	0.83	20	51	45	114
150,000	68 000	140	0.97	20	51	45	114
200,000	90 700	160	1.10	21	53	46	117
300,000	136 100	180	1.25	26	66	51	130
400,000	181 400	200	1.38	30	76	55	140

Charts that convert dual-tandem loadings to PCN numerical values, for both flexible and rigid pavements, are shown in figures 2-5 and 2-6.

(4) Specific Aircraft. Allowable loadings are sometimes established for specific aircraft, such as the double-dual-tandem Boeing 747. Due to the large number of different aircraft and variations of models, it was considered impractical to develop and keep current a great number of conversion charts. To compute PCN numerical values for pavements evaluated for specific aircraft, it is necessary to use ACN values for the aircraft adjusted for the proper allowable load. Table 1 of appendix 2 lists ACN values for several selected aircraft.

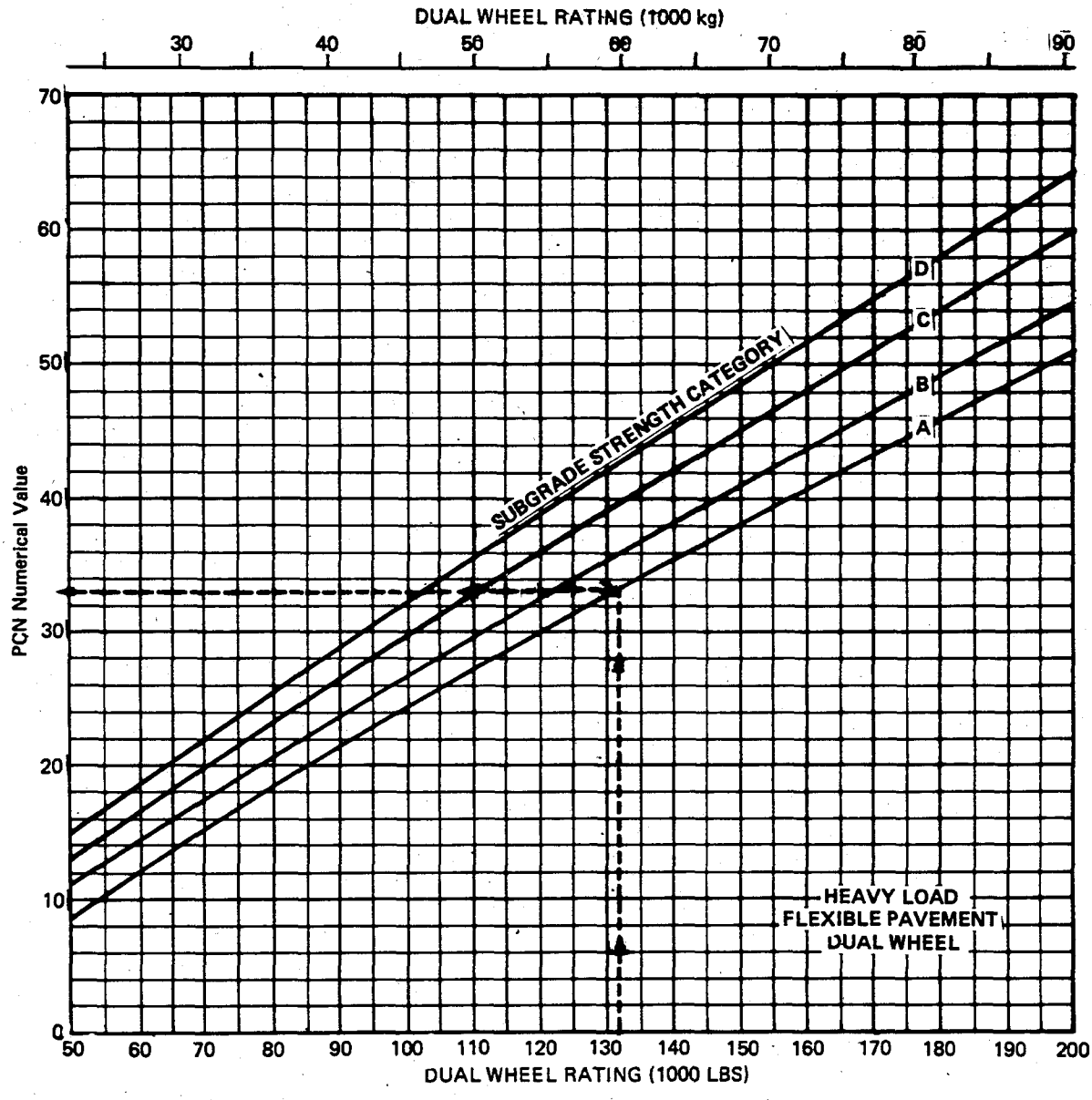

Figure 2-3. PCN Numerical Values for Dual-Wheel Load Rating--Heavy Load Flexible Pavement

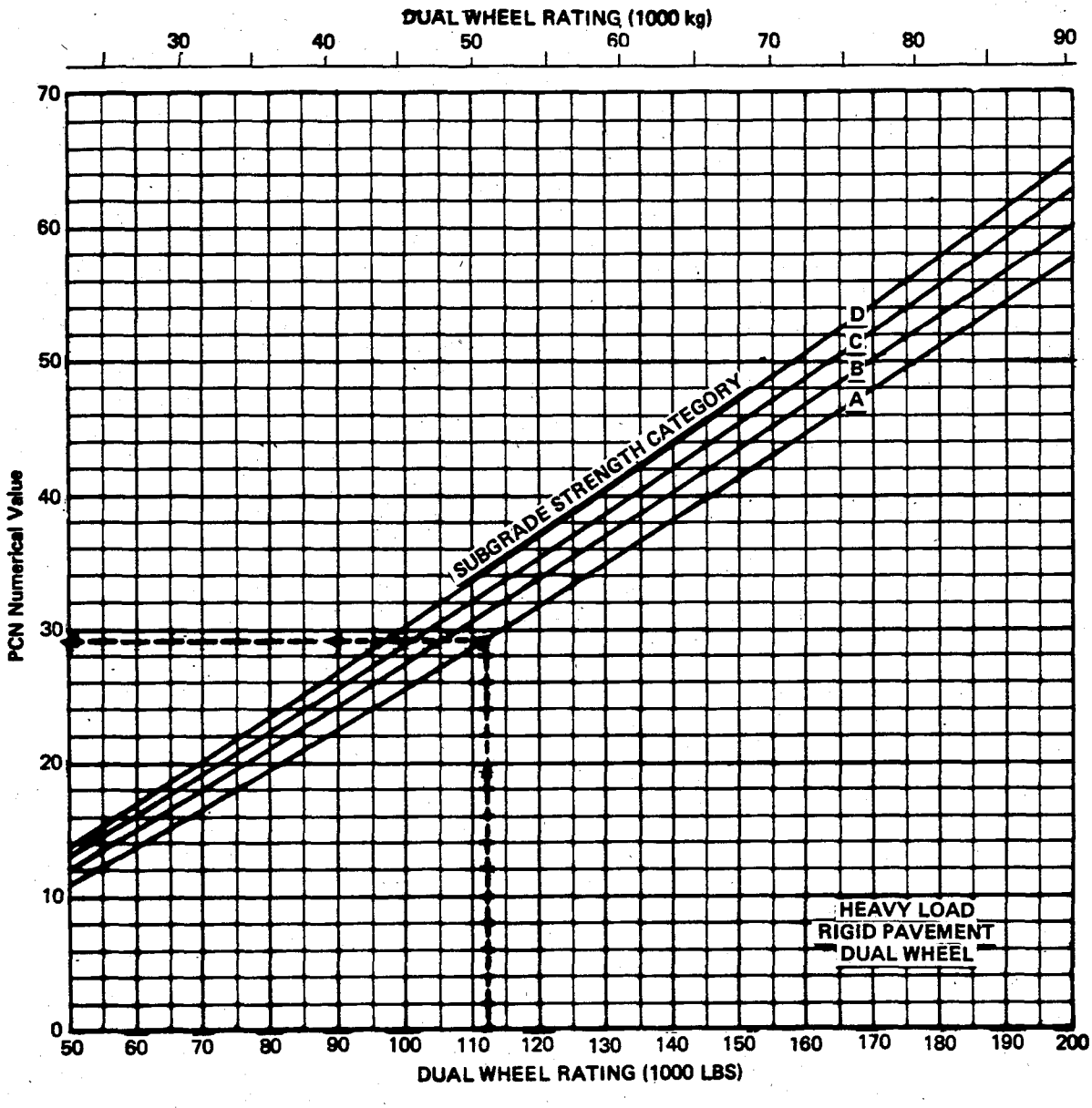

Figure 2-4. PCN Numerical Values for Dual-Wheel Load Rating--Heavy Load Rigid Pavement

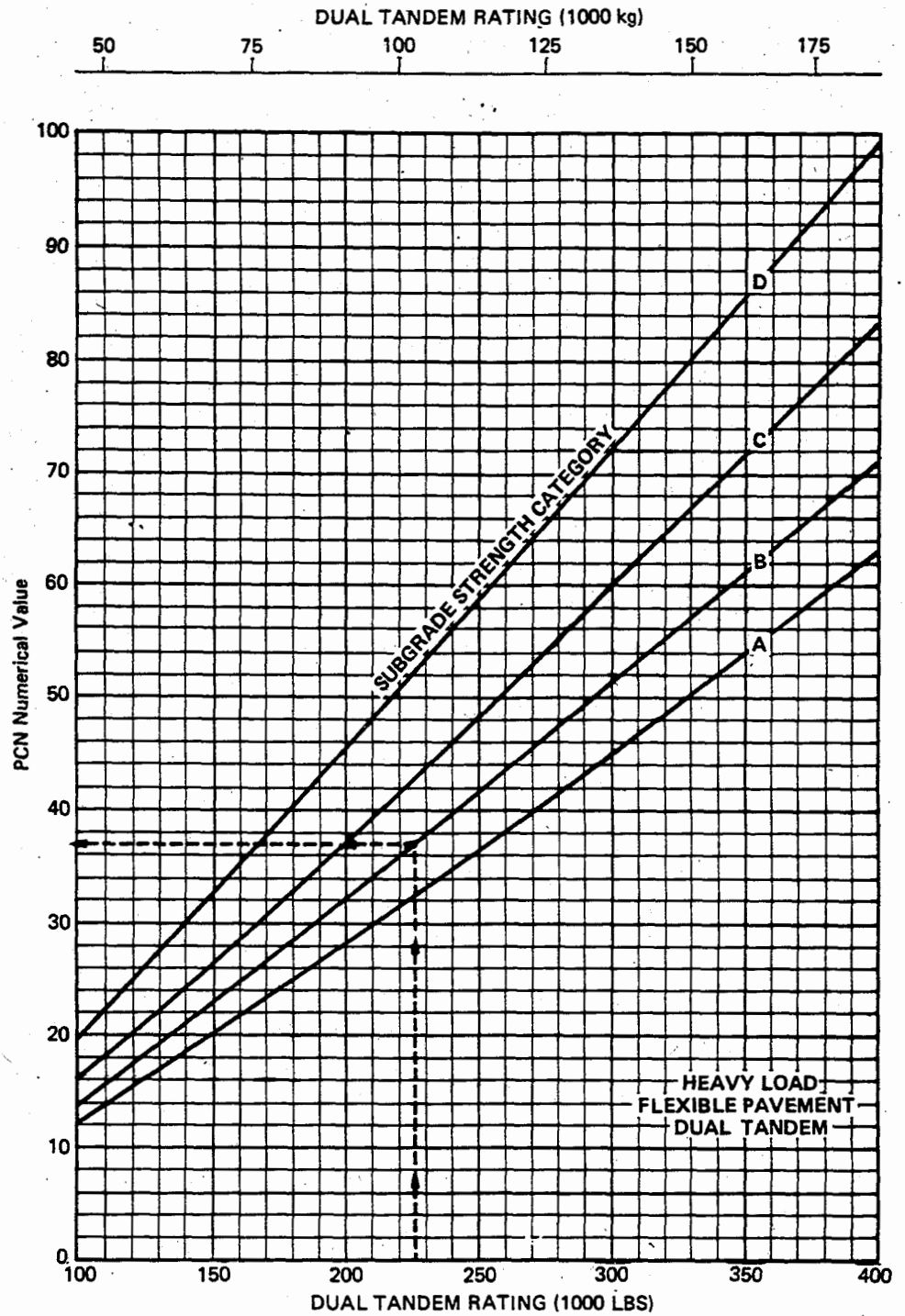

Figure 2-5. PCN Numerical Values for Dual-Tandem Load Rating--Heavy Load Flexible Pavement

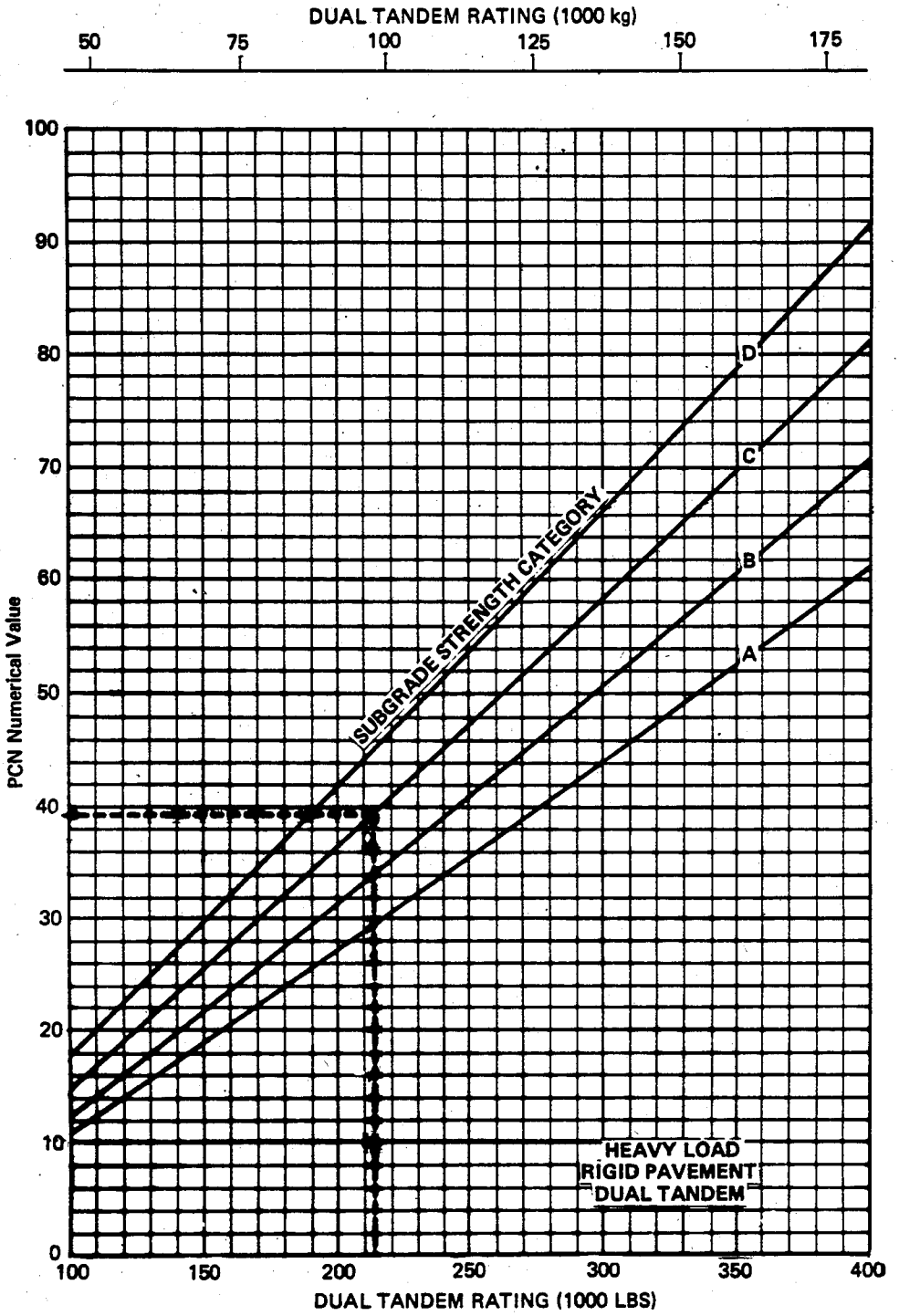

Figure 2-6. PCN Numerical Values for Dual-Tandem Load Rating--Heavy Load Rigid Pavement

The computation of the PCN numerical value from the ACN is appropriate since the ACN and PCN are computed using the same technical basis. The use of linear interpolation for loadings other than those listed in table 1 is sufficiently accurate for this determination. For example, assume a rigid pavement supported on a medium strength subgrade, code B, is capable of supporting operations of DC-10-10 aircraft weighing 390,000 pounds (177 270 kg). Referring to table 1 of appendix 2 for DC-10-10, rigid pavement, code B, yields ACN values of:

@ 433,000 lbs (196 406 kg) ACN = 52

@ 240,171 lbs (108 940 kg) ACN = 25

$$\text{PCN for } 390{,}000 \text{ lbs. } (177\ 270 \text{ kg}) = 52 - \frac{433{,}000 - 390{,}000}{433{,}000 - 240{,}171} \times (52-25) = 52-6=46$$

Therefore, the PCN numerical value of a rigid pavement on a code B subgrade, evaluated for a DC 10-10 weighing 390,000 lbs. (177 270 kg) is 46.

15. EXAMPLES. Examples of PCN computations are given below to illustrate the procedures.

a. Dual Tandem. Assume a flexible pavement has been evaluated for 250,000 pounds (113 640 kg) gross weight on a dual-tandem gear. Past records show the subgrade to be F6. Tire pressures of 200 psi (1.38 MPa) are considered the maximum the flexible pavement surface can tolerate.

(1) Refer to table 2-2 and determine the subgrade category --it is low, code C.

(2) Enter figure 2-5 with the dual-tandem rating of 250,000 pounds (113 640 kg) and make a vertical projection to the code C subgrade strength line. From this intersection point make a horizontal projection to the left ordinate--the PCN numerical value of 48.

(3) In table 2-3 tire pressure limitation of 200 psi (1.38 MPa) corresponds to the medium category, code X.

(4) Therefore, the complete PCN for this example is:

48/F/C/X/T

b. Mixed Aircraft. Often pavements are rated for several different aircraft, but the PCN method system requires that pavement strength be reported in a single 5 character code. In the case where several strength ratings are given, the problem becomes one of selecting the proper PCN to report. Assume a rigid pavement has been evaluated as follows:

Single Wheel	- 75,000 lbs +	(34 090 kg+)
Dual Wheel	- 180,000 lbs	(81 820 kg)
Dual Tandem	- 340,000 lbs	(154 550 kg)
L 1011-1	- 400,000 lbs	(181 820 kg)

The subgrade modulus, k value, is 350 pci (91 MN/m^3).

(1) The subgrade modulus is medium strength, code B, from Table 2-1.

(2) The PCN numerical values for the various evaluations are found as follows:

Single Wheel	- 28	+	(Figure 2-2)
Dual Wheel	- 53		(Figure 2-4)
Dual Tandem	- 59		(Figure 2-6)
L 1011-1	- 48		(Interpolate from table 1, appendix 2)

(3) The problem is illustrated graphically in figure 2-7. If the pavement has been performing satisfactorily under dual-tandem loads of 340,000 lbs (154 550 kg), the PCN numerical value is 59. Since the pavement is rigid, tire pressure would not normally be restricted and code W would apply. Therefore, PCN code for this example is:

59/R/B/W/T

(4) In this example, the variation in allowable loadings was purposely exaggerated to illustrate the procedure. In normal use, such large disparities in PCN numerical values would not be expected. The example also demonstrates the differences in load carrying capacity of various landing gear configurations.

16. LIGHT LOAD PAVEMENTS. The method of determining PCN values for light load pavements, designed to serve aircraft weighing between 29,999 pounds (13 000 kg) and 12,500 pounds (5 700 kg), is similar to the one used for heavy load pavements. The same five character code described in the previous paragraphs applies.

a. Flexible Pavments. A curve relating gross weight-bearing strength for flexible pavement to PCN numerical values is shown in figure 2-8. For light load pavements, a single curve is used because the light load pavement evaluation criteria do not discriminate among different landing gear configurations. A new curve is required because the materials in light load pavements are of lower quality than those in heavy load pavements. Use of this curve requires an input for gross weight-bearing strength and a subgrade strength category. The chart is entered with the gross weight-bearing strength. A vertical projection is made to the appropriate subgrade strength category line. At the point of intersection, a horizontal projection is made to the left ordinate for the PCN numerical value. Note that the PCN numerical value is reported to the nearest whole number.

b. Rigid Pavements. A curve relating gross weight-bearing strength for rigid pavements to PCN numerical values is sho in figure 2-9. For light load rigid pavements, a single line is used because landing gear configuration and subgrade strength are not variables in the evaluation process. Even though the subgrade strength category is not shown in figure 2-9, however, an input is required for this category in the five character PCN code. Use of figure 2-9 requires an input for gross weight-bearing strength. A vertical projection is made to the sloping pivot line. At the point of intersection, a horizontal projection is made to the left ordinate for the PCN numerical value. Note that the PCN numerical value is reported to the nearest whole number.

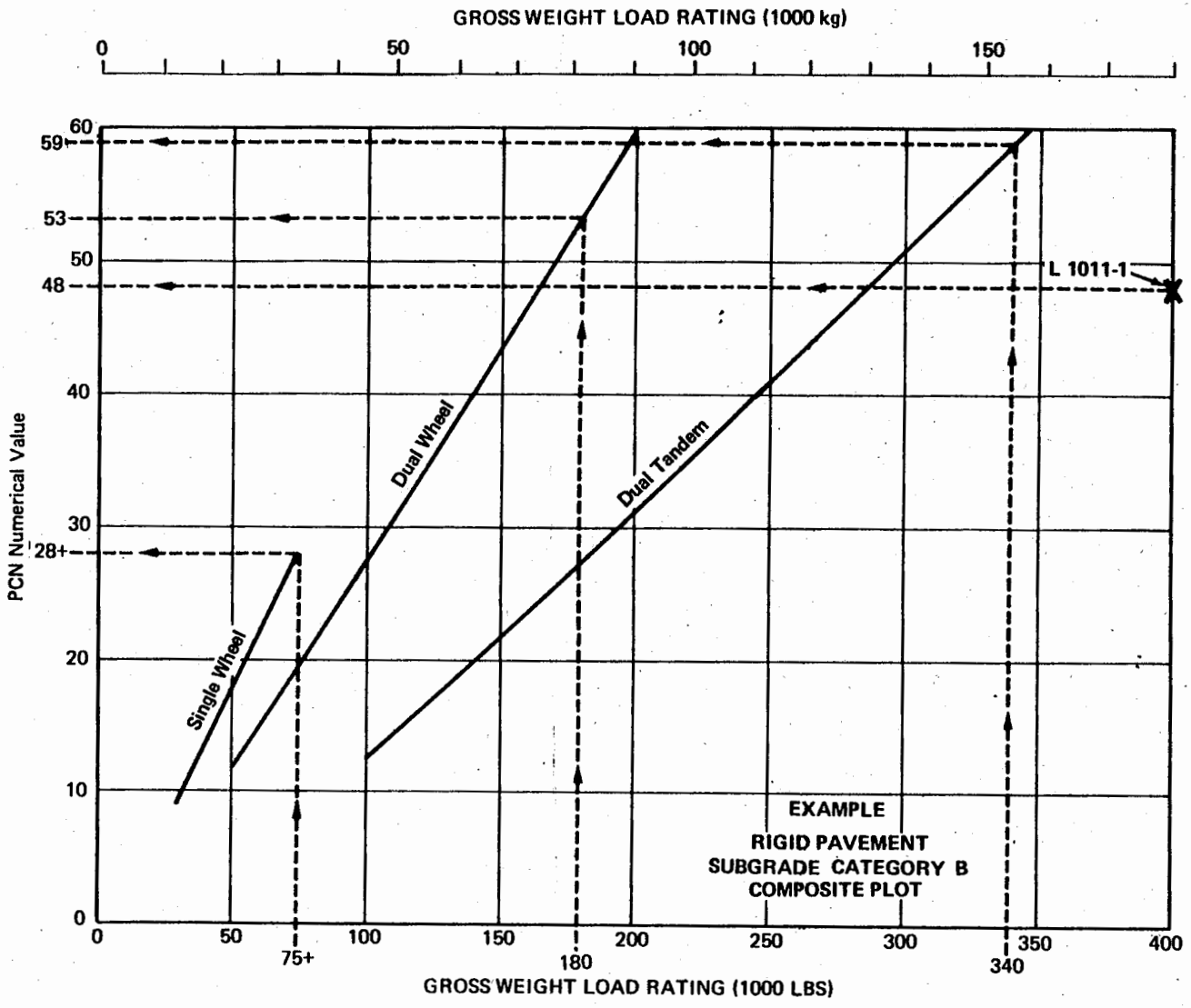

Figure 2-7. PCN Numerical Value for Various Load Ratings--Example Plot

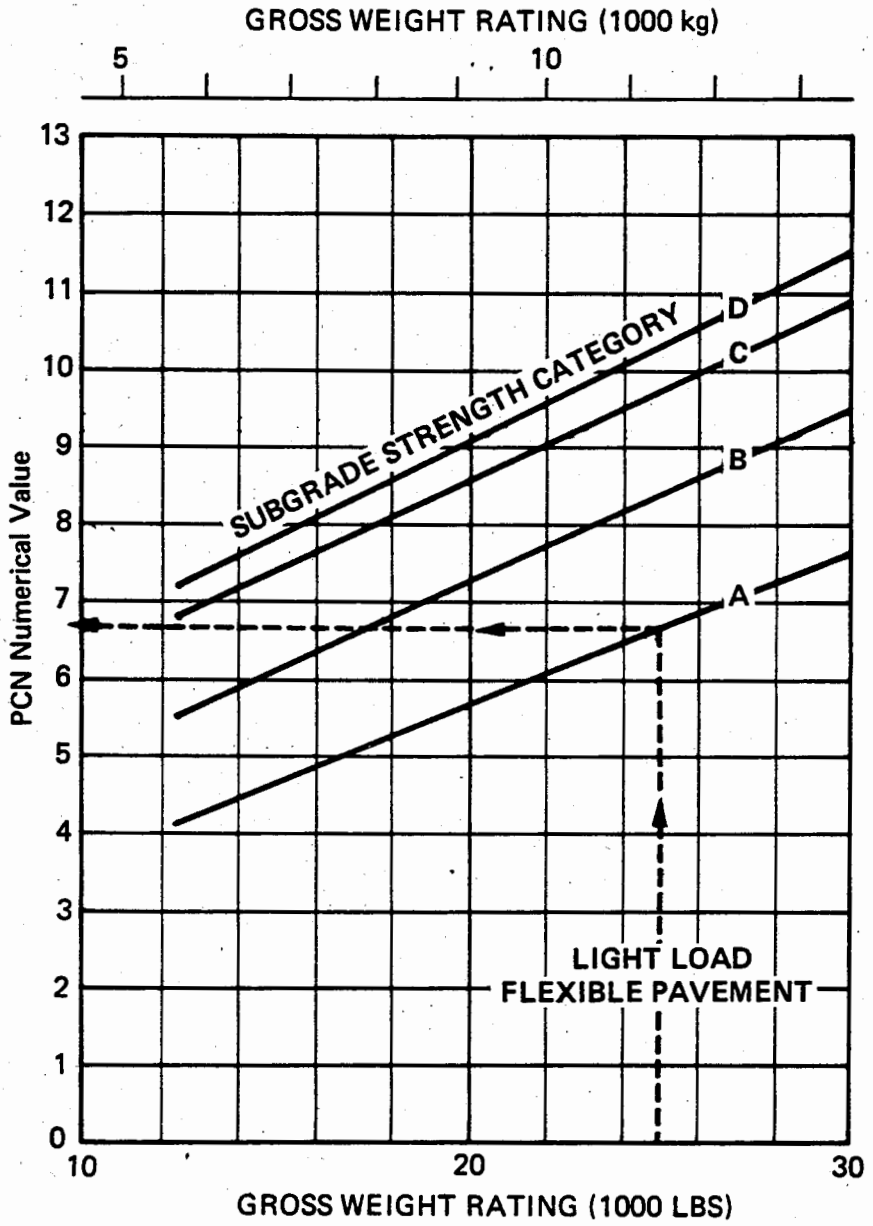

Figure 2-8. PCN Numerical Values For Gross Weight Rating--Light Load Flexible Pavement

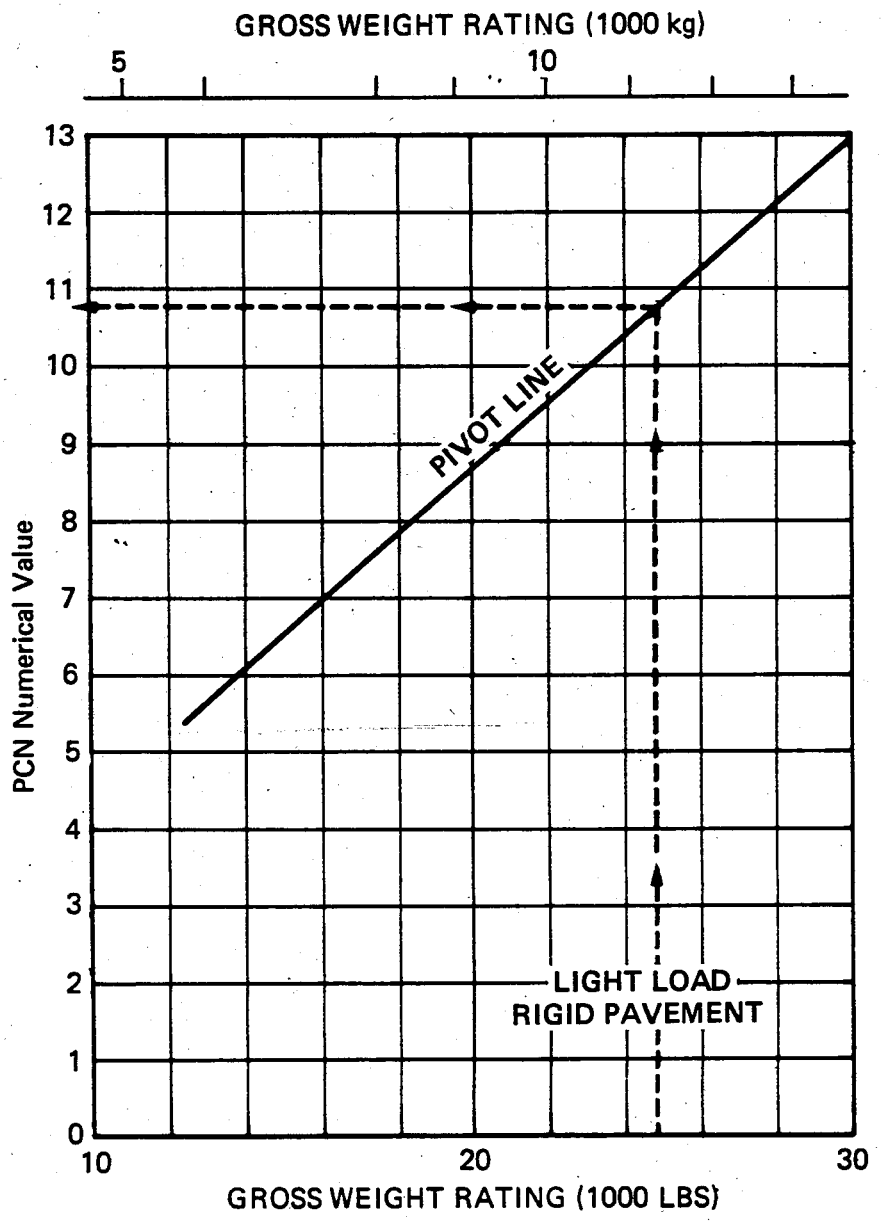

Figure 2-9. PCN Numerical Value for Gross Weight Rating--Light Load Rigid Pavement

17. PAVEMENTS OF LESS THAN 12,500 POUNDS (5 700 kg) BEARING STRENGTH. The PCN method of reporting pavement bearing strength will not be used for pavements with bearing strengths of less than 12,500 (5 700 kg). The bearing strengths of these pavements will continue to be reported as allowable weight in pounds.

18. SUMMARY. A summary consolidating all the information described in the preceding paragraphs is presented in table 2-7.

TABLE 2-7. PCN -- FIVE PART CODE

PCN	Pavement Type	Subgrade Strength[1]	Tire Pressure[2]	Method
Numerical Value	R - rigid F - flexible	A	W	T - Technical U - Using Aircraft
		B	X	
		C	Y	
		D	Z	

Note 1:
SUBGRADE STRENGTH:

		Flexible Pavement	Rigid Pavement	Soils Classification	
Code	Category	CBR	lbs/cu.in.	Unified	FAA
A	High	over 13	over 400	GW,GP,GM	Fa,F1,F2
B	Medium	8 - 13	201-400	GC,SW,SM,SP	F3,F4,F5
C	Low	4 - 8	100-200	SC,ML,CL,OL	F6,F7,F8,F9
D	Ultra-low	less than 4	less than 100	OM,CH,MH	F10

Note 2:
TIRE PRESSURE:

Code	Category	psi	MPa
W	High	no limit	no limit
X	Medium	146 - 217	1.01 - 1.50
Y	Low	74 - 145	0.51 - 1.00
Z	Ultra-low	0 - 73	0 - 0.50

APPENDIX 1. RELATED READING MATERIAL

The following publications were used in the development of this AC.

a. FAA Order 2100.13, FAA Rulemaking Policies, Department of Transportation, Federal Aviation Administration, Washington, D.C. 20591.

b. AC 150/5320-6, Airport Pavement Design and Evaluation. This publication is available free of charge from the Department of Transportation, Publications Section, M-442.32, Washington, D.C., 20590.

c. ICAO Bulletin, Official Magazine of International Civil Aviation, Airport Technology, Volume 35, No. 1, Montreal, Quebec, Canada H3A 2R2, January 1980.

APPENDIX 2. SELECTED ACN VALUES

1. This appendix lists ACNs for selected aircraft. These date were extracted from several sources including: Airplane Characteristics - Airport Planning (NAS 3601) by various airplane manufacturers; Aircraft Loading on Airport Pavements, ACN - PCN, Aircraft Classification Numbers for Commercial Turbojet Aircraft, prepared by the U.S. Aviation and Industry Working Group, March 1983; and International Standards and Recommended Practices, Aerodromes, Annex 14 to the Convention on International Civil Aviation, Guidance Material Related to the ACN - PCN Method of Reporting Pavement Strength, November 1983.

2. The ACN values shown in table 1 were computed in accordance with the procedure described in paragraph 4 of the main body of this AC.

3. Magnetic tapes of two computer programs for the computation of aircraft ACN values can be purchased from the ICAO for $200. Requests should be sent to the address below:

International Civil Aviation Organization
P.O. Box 400
Place de l'Aviation Internationale
Montreal, Quebec, Canada H3A2R2

The price includes systems maintenance, i.e., receipt of software change throughout the lifetime of the system.

In addition, ICAO (AGA Section) will provide printouts as follows:

a. For evaluation of aircraft on rigid pavements--$100 for computation of one ACN, plus $40 for each additional ACN determination included in the same request.

b. For evaluation of aircraft on flexible pavements--a minimum charge of $100 per request which may include up to four ACN computations, plus $10 for each additional ACN computation (beyond the initial four) included in the same request.

Table 1. ACNs For Several Aircraft Types on Rigid and Flexible Pavements

Aircraft Type	Weight		Tire Pressure		RIGID PAVEMENT SUBGRADE				FLEXIBLE PAVEMENT SUBGRADES			
					High A	Medium B	Low C	Ultra Low D	High A	Medium B	Low C	Very Low D
	lb.	(kg)	psi	(MPa)								
A-300	304,000	137 900	179	1.23	36	43	51	58	39	43	53	67
Model B2	188,914	85 690			19	22	26	30	21	23	26	35
A-300	332,700	150 900	205	1.41	42	50	58	66	44	49	59	75
Model B4	193,623	87 826			20	23	27	33	23	24	28	36
A-310	332,680	150 900	143	0.99	35	44	53	62	43	47	59	77
	169,200	76 750			15	17	21	24	17	18	21	29
A-320	146,385	66 400	173	1.19	38	40	42	44	33	34	38	44
Model 100	95,460	43 253			23	24	26	27	21	21	23	27
BAC 111	87,500	39 690	135	0.93	25	26	28	30	22	24	27	30
Series 400	49,600	22 498			14	14	15	16	11	13	14	16
BAC 111	98,500	44 679	82	0.57	22	25	27	28	20	24	29	32
Series 475	51,700	23 451			10	11	12	13	9	11	13	15
BAC 111	104,500	47 400	156	1.08	33	35	36	38	29	30	33	35
Series 500	54,580	24 757			16	17	18	19	13	14	16	18
BAe 146	82,227	37 308	116	0.80	18	20	22	23	17	18	20	24
Series 100	50,692	23 000			10	11	12	13	10	10	11	13
BAe 146	82,227	37 308	75	0.52	16	18	19	21	13	16	19	23
Series 100	50,692	23 000			9	10	11	12	8	9	11	13
BAe 146	89,482	40 600	128	0.88	22	23	25	26	19	21	23	27
Series 200	50,692	23 000			11	12	13	14	10	10	11	13
BAe 146	89,482	40 600	88	0.61	19	21	23	24	16	20	22	27
Series 200	50,692	23 000			10	11	12	12	8	10	11	13

Table 1. ACNs For Several Aircraft Types on Rigid and Flexible Pavements

Aircraft Type	Weight		Tire Pressure		RIGID PAVEMENT SUBGRADE				FLEXIBLE PAVEMENT SUBGRADES			
	lb.	(kg)	psi	(MPa)	High A	Medium B	Low C	Ultra Low D	High A	Medium B	Low C	Very Low D
B707-120	258,000	117 100	170	1.17	28	33	40	46	31	34	41	54
	127,500	57 600			13	13	16	18	13	14	16	20
B 707-300/400	336,000	152 410	180	1.24	41	49	58	66	44	49	60	77
	135,500	61 460			13	14	17	19	14	15	17	21
B 720/720B	235,000	106 590	145	1.00	25	30	37	43	29	31	39	51
	115,000	52 160			10	11	14	16	11	12	14	18
B 727-100	170,000	77 110	165	1.14	46	48	51	53	41	43	49	54
	87,600	39 730			21	22	23	25	19	20	21	25
B 727-200	173,000	78 470	167	1.15	48	50	53	56	43	45	51	56
STANDARD	97,650	44 290			24	26	27	29	22	23	25	29
B 727-200	210,000	95 250	173	1.19	58	61	64	67	52	55	62	66
ADVANCED	97,600	44 270			22	24	26	27	20	21	24	28
B 737-100	111,000	50 350	157	1.08	27	29	31	32	25	25	29	33
	58,600	26 580			12	13	14	15	12	12	13	15
B 737-200	117,500	53 300	168	1.16	30	31	33	35	27	28	31	35
ADVANCED	59,900	27 170			13	14	15	16	12	12	14	16
B 737-200	117,500	53 300	96	0.66	25	27	29	31	22	26	30	35
LOW PRESS	64,500	29 260			12	13	15	16	11	13	14	17
B 737-200	128,600	58 330	182	1.25	34	36	38	39	29	31	34	39
ADVANCED	63,100	28 620			14	15	16	17	13	13	15	17

Table 1. ACNs For Several Aircraft Types on Rigid and Flexible Pavements

Aircraft Type	Weight		Tire Pressure		RIGID PAVEMENT SUBGRADE				FLEXIBLE PAVEMENT SUBGRADES			
					High	Medium	Low	Ultra Low	High	Medium	Low	Very Low
	lb.	(kg)	psi	(MPa)	A	B	C	D	A	B	C	D
B 737-300	135,500	61 460	195	1.34	37	39	41	42	32	33	37	41
	69,400	31 480			17	17	19	20	15	15	16	19
B 747-100	753,000	341 560	191	1.32	42	49	59	68	46	51	62	82
	358,000	162 390			17	19	22	25	19	20	22	28
B 747-200	836,000	379 200	189	1.30	46	55	66	76	52	58	71	92
B, C, F	342,200	155 220			16	17	20	24	18	19	21	27
B 747-300	836,000	379 200	189	1.30	46	55	66	76	52	58	71	92
	363,000	164 650			16	18	21	25	20	20	23	30
B 747SP	703,000	318 880	203	1.40	38	44	53	60	41	45	54	72
	325,660	147 720			14	16	19	22	17	18	20	25
B 757-200	241,000	109 320	170	1.17	27	32	38	44	29	32	39	52
	130,900	59 380			12	13	16	19	13	14	16	21
B 767-200	317,000	143 790	190	1.31	33	38	46	54	37	40	47	65
	174,000	78 930			14	16	19	23	18	18	21	26
B 767-200ER	352,200	159 760	190	1.31	39	46	56	64	44	48	58	78
AND-300	178,400	80 920			16	17	20	24	18	19	22	28
Canadair	211,000	95 708	162	1.12	25	30	35	40	27	30	36	47
CL 44	89,000	40 370			9	10	11	13	9	10	11	14
Caravelle	123,370	55 960	128	0.88	16	19	22	25	17	19	21	26
12	70,105	31 800			8	9	10	12	9	9	10	12
Concorde	412,000	186 880	183	1.26	62	72	83	92	66	73	82	99
	173,500	78 700			21	22	25	29	21	22	26	32

Table 1. ACNs For Several Aircraft Types on Rigid and Flexible Pavements

Aircraft Type	Weight		Tire Pressure		RIGID PAVEMENT SUBGRADE				FLEXIBLE PAVEMENT SUBGRADES			
					High A	Medium B	Low C	Ultra Low D	High A	Medium B	Low C	Very Low D
	lb.	(kg)	psi	(MPa)								
Convair 990	255,000 120,560	115 666 54 685	185	1.28	41 15	48 17	54 19	60 22	40 15	45 16	53 19	64 24
C-130 B Military	135,000 69,300	61 235 31 435	79	0.54	19 9	21 10	24 11	27 13	19 8	23 9	27 10	31 11
C-130 H Military	155,000 75,331	70 305 34 170	96	0.66	29 13	31 14	34 15	37 16	25 12	29 13	30 14	38 16
DC-3	25,200 17,123	11 430 7 765	45	0.31	6 4	7 5	7 5	7 5	4 3	6 4	8 5	9 6
DC-8-55	328,000 131,230	148 781 59 526	188	1.30	46 14	54 15	63 18	69 21	45 14	51 15	61 16	75 22
DC-8-62/72	353,000 138,560	160 121 62 851	187	1.29	47 14	56 15	65 18	73 21	49 15	56 16	67 17	83 23
DC-8-63/73	358,000 141,330	162 389 64 107	195	1.34	50 14	60 15	69 19	78 21	52 15	59 16	71 18	87 24
DC-9-32	109,000 56,855	49 442 25 789	152	1.05	28 14	31 15	33 16	34 17	26 12	28 13	31 14	34 16
DC-9-51	122,000 64,675	55 388 29 337	170	1.17	35 16	37 17	39 18	40 19	30 15	32 16	36 16	39 19
MD-81/87	141,000 78,420	63 957 35 571	170	1.17	41 20	43 21	45 23	46 24	36 18	38 19	43 21	46 24
MD-82/88	150,500 78,548	68 266 35 629	184	1.27	45 21	47 22	49 24	50 25	39 18	42 19	46 20	50 24

Table 1. ACNs For Several Aircraft Types on Rigid and Flexible Pavements

Aircraft Type	Weight		Tire Pressure		RIGID PAVEMENT SUBGRADE				FLEXIBLE PAVEMENT SUBGRADES			
					High	Medium	Low	Ultra Low	High	Medium	Low	Very Low
	lb	(kg)	psi	(MPa)	A	B	C	D	A	B	C	D
MD-83	161,000	68 266	195	1.34	49	51	53	55	42	46	50	54
	79,873	36 230			21	22	24	25	18	19	21	24
DC-10-10	443,000	200 942	190	1.31	46	54	64	75	54	58	69	96
	232,100	105 279			22	24	27	31	24	25	28	36
DC-10-10	458,000	207 746	195	1.34	48	56	67	79	55	61	72	100
	232,100	105 279			22	24	27	31	24	25	28	36
DC-10-30	558,000	253 105	170	1.17	44	53	64	75	53	59	70	97
-40	266,190	120 742			20	21	24	28	22	23	25	32
DC-10-30	575,000	260 816	175	1.21	46	55	67	78	56	61	74	101
-40	273,500	124 058			20	21	25	29	23	23	26	33
DC-10-30	593,000	268 981	180	1.24	49	59	71	83	59	64	78	106
-40	273,500	124 058			20	21	25	29	23	23	26	33
DCH 7	43,000	19 505	107	0.74	11	12	13	13	10	11	12	14
(Dash 7)	26,450	11 998			6	6	7	7	5	6	6	8
Fokker 27	43,589	19 777	78	0.54	10	11	12	12	8	10	12	13
MK 500	26,181	11 879			5	6	6	7	4	5	6	7
Fokker 28	65,000	29 484	84	0.58	14	15	17	18	11	14	16	19
MK 1000 LTP	34,500	15 650			6	7	8	9	5	6	7	9
Fokker 28	65,000	29 484	100	0.69	15	16	18	18	13	15	17	20
MK 1000 HTP	36,485	16 550			8	8	9	10	6	7	8	10
HS 125-400	23,370	10 600	112	0.77	6	6	7	7	5	5	6	7
	12,530	5 683			3	3	3	3	2	3	3	3

Table 1. ACNs For Several Aircraft Types on Rigid and Flexible Pavements

Aircraft Type	Weight		Tire Pressure		RIGID PAVEMENT SUBGRADE				FLEXIBLE PAVEMENT SUBGRADES			
					High	Medium	Low	Ultra Low	High	Medium	Low	Very Low
	lb.	(kg)	psi	(MPa)	A	B	C	D	A	B	C	D
HS 125-600	25,000	11 340	120	0.83	7	7	7	8	5	6	7	8
	12,530	5 683			3	3	3	3	2	3	3	3
HS 748	46,500	21 092	86	0.59	10	11	11	12	8	9	11	13
	26,860	12 183			5	5	6	6	4	5	6	7
ILYUSHIN IL-62	356,200	161 570	239	1.65	47	54	62	70	48	52	61	76
	146,385	66 400			17	18	19	21	16	17	18	23
L1011-1	432,000	195 955	180	1.24	43	49	61	71	48	53	64	88
	240,000	108 864			21	24	29	35	24	26	29	35
L1011-100 and 200	468,000	212 285	175	1.21	45	54	66	78	53	60	72	97
	243,133	110 264			23	25	30	37	24	26	28	36
L1011-500	498,000	225 889	184	1.27	51	57	70	82	56	63	77	104
	240,139	108 925			23	25	30	37	24	26	28	36
Trident 1E	134,835	61 160	149	1.03	32	34	37	39	23	24	27	32
	73,200	33 203			15	16	17	18	10	11	12	15
Trident 2E	145,500	65 998	155	1.07	37	39	42	44	26	28	31	36
	74,915	33 980			16	17	18	19	11	12	13	16
Trident 3	150,500	68 266	165	1.14	37	40	42	44	26	28	31	36
	86,110	39 060			18	20	21	23	11	12	14	16
Vickers VC10-1150	335,000	151 953	147	1.01	38	46	56	65	44	50	61	77
	158,600	71 940			16	17	20	23	17	18	21	27

determination of the PCN. Using aircraft evaluation (U) means the PCN was determined by selecting the highest ACN among the aircraft currently using the facility and not causing pavement distress. No technical input is required for the using aircraft evaluation method. PCN values computed from allowable loads shown on FAA Form 5010-1, Airport Master Record, should be considered technical evaluations. Publication of a using aircraft evaluation on the FAA Form 5010-1 is permitted only by mutual agreement between the airport owner and the FAA.

14. COMPUTATION OF PCN NUMERICAL VALUES. Procedures for the computation of PCN numerical values are presented in two different categories--heavy load pavements, intended to support aircraft weighing 30,000 pounds (13 000 kg) or more, and light load pavements, intended to support aircraft weighing between 29,999 pounds (13 000 kg) and 12,500 pounds (5 700 kg). These categories were chosen to be consistent with FAA pavement design and evaluation standards.

a. Heavy Load Pavements. The computation of PCN numerical values is designed to require a minimum number of inputs. Charts have been developed which require input for subgrade strength category and allowable gross weight. With these two parameters, a PCN numerical value can be obtained. Charts to compute PCN values for single, dual, and dual-tandem landing gear are shown in figures 2-1 through 2-6. The single, dual, and dual-tandem ratings are for generalized landing gear configurations and do not represent specific aircraft. A conversion for double-dual-tandem landing gear was not prepared because this rating refers to a specific aircraft, the Boeing 747. In the generalized landing gear configurations, certain assumptions are made, i.e., all aircraft are assumed to have 95 percent of the gross weight carried by the main gear assembly and the nose gear assembly is assumed to carry 5 percent of the gross weight of the aircraft. Other assumed characteristics are discussed in the following subparagraphs.

(1) Single Wheel. Table 2-4 shows the characteristics which are assumed for the main landing gear assembly.

TABLE 2-4. SINGLE WHEEL ASSEMBLY

Gross Weight		Tire Pressure	
lbs.	kg	psi	MPa
30,000	13 600	75	0.52
45,000	20 400	90	0.62
60,000	27 200	105	0.73
75,000	34 000	120	0.83

Using the above assumptions, charts that convert single-wheel allowable gross weight to PCN numerical values, for both flexible and rigid pavements, are shown in figures 2-1 and 2-2.

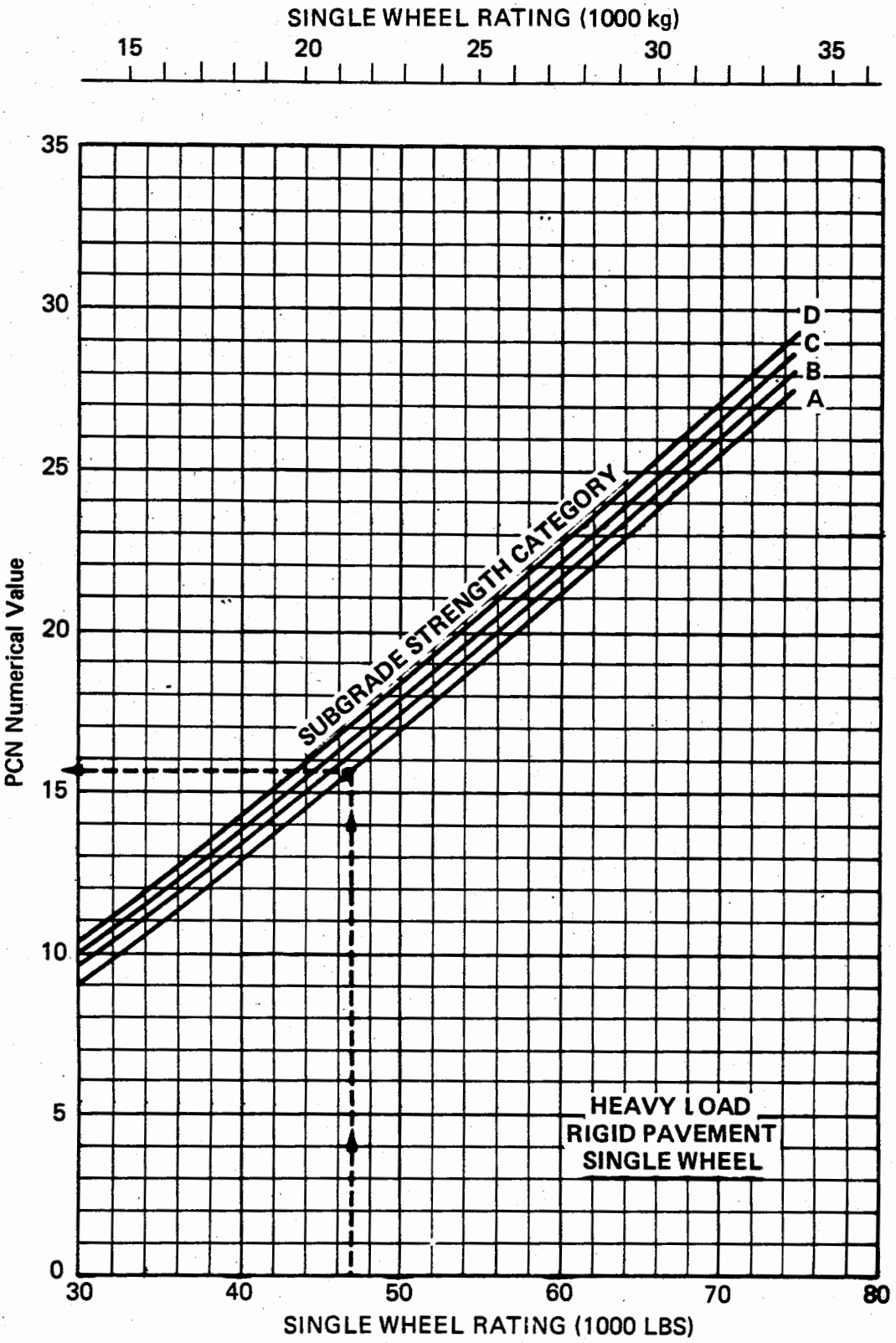

Figure 2-2. PCN Numerical Values for Single-Wheel ~~L~~oad Rat~~i~~ng--Heavy Load Rigid Pavement

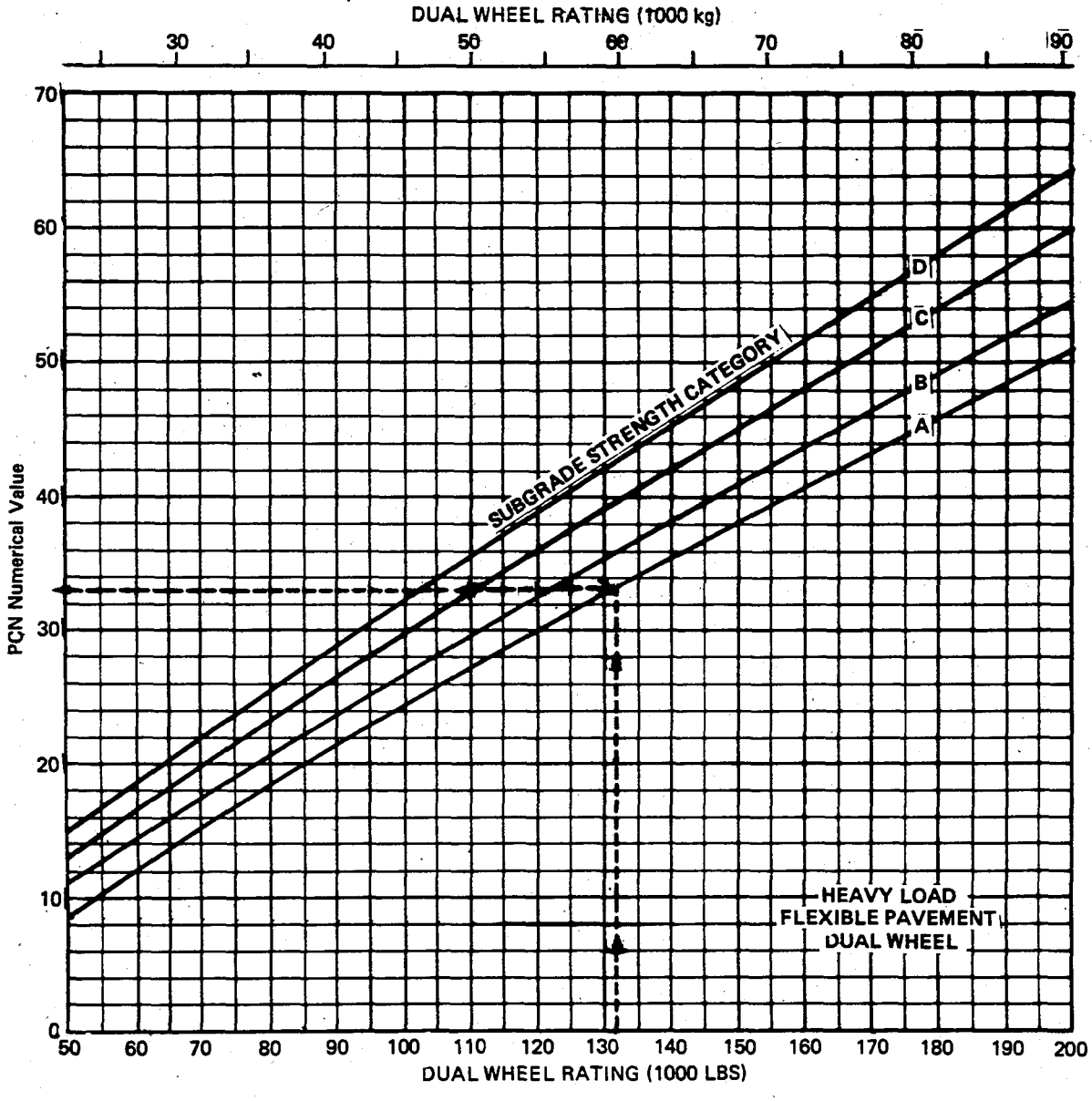

Figure 2-3. PCN Numerical Values for Dual-Wheel Load Rating--Heavy Load Flexible Pavement

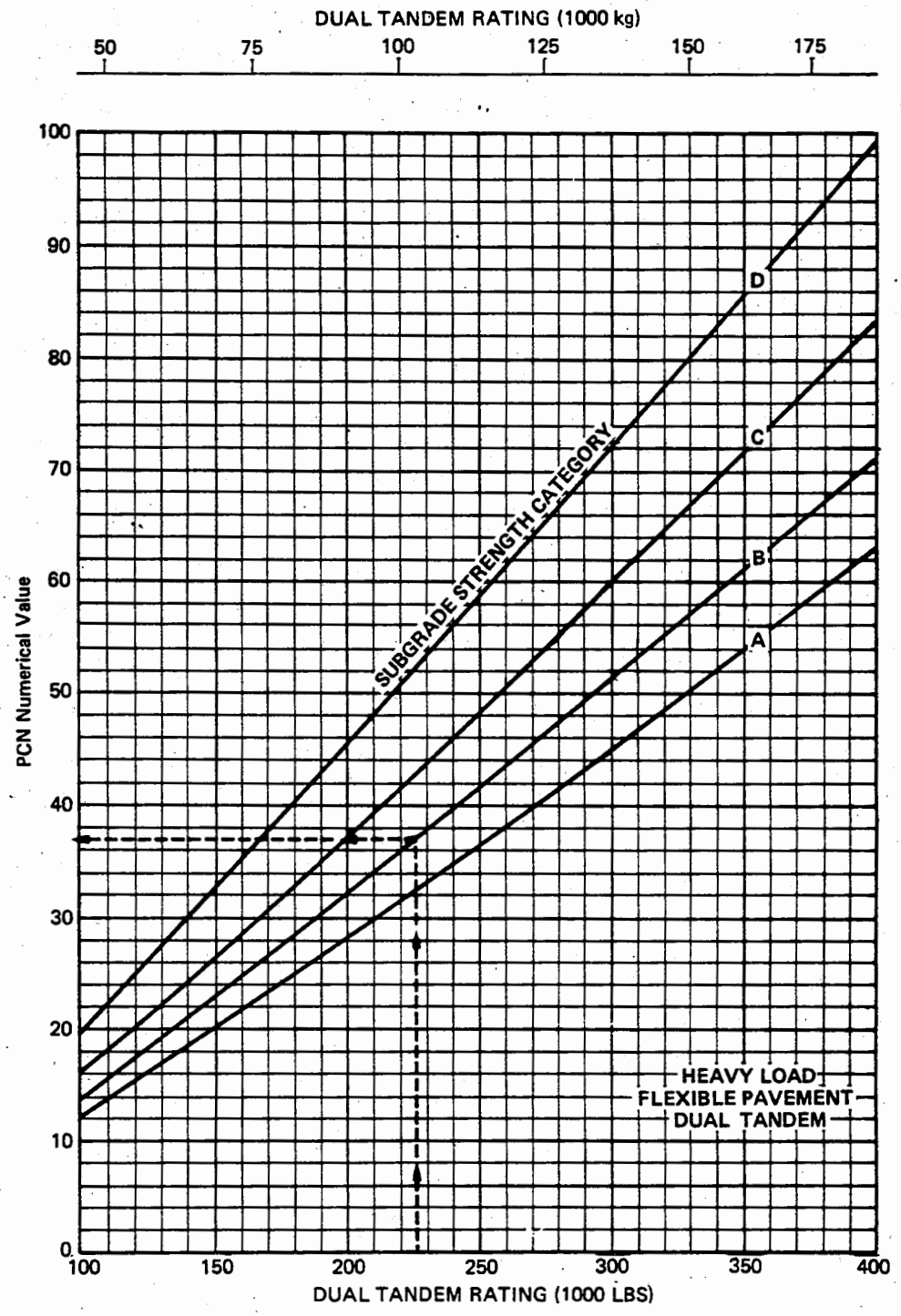

Figure 2-5. PCN Numerical Values for Dual-Tandem Load Rating--Heavy Load Flexible Pavement